ACTUARIAL VALUATION

BASICS

PUBLIC EMPLOYEE RETIREMENT ADMINISTRATION COMMISSION

ACTUARIAL VALUATION

BASICS

PERAC TRAINING SERVICES
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1. Actuarial Valuation Basics

AN ACTUARIAL VALUATION OF A RETIREMENT PLAN IS AN ESTIMATE OF A PLAN'S FINANCIAL POSITION AT A SPECIFIC POINT IN TIME. During a valuation, an actuary takes a "snapshot" of the membership as of a given date to determine the plan's liabilities and funded status.

An actuarial valuation projects the expected cash flow of plan members' benefits. Actuarial projections are derived from a combination of judgement and science, based on assumptions about the likely occurrence of future events that affect the outcome and duration of pension benefits.

ASSUMPTIONS

Two types of assumptions are used in valuations—economic and demographic. Of the two, economic assumptions usually have a greater impact on plan liabilities. Two key economic assumptions are investment return—used to determine the present value of future liabilities, and salary increases—used to project current pay until retirement. Demographic assumptions deal with the likelihood of termination of employment, retirement, disability, or death at each age.

Actuarial assumptions are primarily based on past experience or standard tables. Recent experience should be considered but it is not the main factor in setting assumptions. For example, even though salary increases and inflation have generally been low since the early 1990s, a much longer-term view should be considered. It is important to understand that a long-term view, from an actuarial standpoint, is not ten years, but twenty or thirty years.

Assumptions can result in actuarial gains or losses. For example, if salaries increase by an amount greater than that which was assumed, an actuarial loss will result. If salaries increase by a lesser amount than expected, there will be an actuarial gain. It is important to note that how assumptions work together as a group is more important to the overall valuation results than the accuracy of an individual assumption. One assumption may somewhat overstate the actuarial liability and another may understate it, but taken together, they may balance each other out.

Actuarial valuations are affected by many variable factors, such as rates of retirement, termination, disability, death and general economic conditions. Actuaries must apply their best judgement when estimating how and when conditions are likely to change. Each valuation "trues-up" the estimates from prior valuations. Over time, adjustments are made to assumptions, as needed, based on plan experience.

SCHEDULING VALUATIONS

Adherence to a schedule of regular valuations is likely to result in the early identification of trends and appropriate adjustments being made on a timely basis. Periodic valuations enable a retirement board to guard against an unexpected and sizable increase in a system's funding schedule and appropriation amount.

The Public Employee Retirement Administration Commission (PERAC) is required by Section 21(3) of Chapter 32 to oversee an actuarial valuation of

each retirement system every three years. The Governmental Accounting Standards Board (GASB) requires valuations to be performed at least every two years for financial reporting purposes. PERAC believes that a schedule of annual valuations is a sound business practice and a hallmark of a well-managed pension system. At an absolute minimum, valuations should be performed very two years. If a retirement system performs a valuation only every two years, PERAC strongly recommends that an interim valuation be conducted during the off year. In an interim valuation, actual plan assets and an estimate of liabilities are used to estimate the funded status of a plan.

The financial condition of a retirement system has a significant impact on municipal finances, including the cost of borrowing. Rating agencies cite retirement issues as a determining factor in establishing bond ratings. If a valuation is not performed and/or the system's funding schedule is not updated at least every three years, PERAC must determine the appropriation level for the coming fiscal year on a conservative basis.

The financial condition of a retirement system has a significant impact on municipal finances, including the cost of borrowing.

PRIVATE VALUATIONS

The completion of annual or biennial valuations of all 106 contributory retirement systems requires the assistance and cooperation of the private actuarial community. PERAC encourages retirement systems to conduct RFPs (Request for Proposals) to select private actuaries with whom they can establish ongoing relationships. There are a number of firms that provide actuarial services for pension plans. In fact, PERAC now posts recently completed valuation studies (including those completed by PERAC in-house and those provided by private actuaries) on PERAC's Home Page on the Internet: www.state.ma.us/perac. Retirement boards are encouraged to view these reports and to contrast and compare the various presentations.

PERAC will accept a private valuation as meeting the triennial requirement stipulated in Chapter 32, provided the Commission staff has the opportunity to work with the private actuarial firm throughout the valuation process and to review their draft report before the valuation is finalized.

ACTUARIAL FUNDING

Actuarial funding determines the annual cost to fund a retirement system's cost of benefits that accrue during the current year (normal cost) as well as the costs associated with any past service liability (unfunded actuarial accrued liability). One of the main principles of advance or actuarial funding is the premise that the cost of retirement benefits for a current employee should be paid during the years of service of that employee—the period for which the taxpayers are receiving the benefits of the services of that employee. Under the pay-as-you-go method formerly in effect, annual appropriations were limited to the amount of benefits that were expected to be paid out to retirees. There were no provisions for advance funding for benefits to be paid in the future. Under the funding schedules now in effect, a series of payments is established to pay the annual normal cost as well as amortize the unfunded accrued liability (actuarial liability less plan assets) over a period of years.

In accordance with Chapter 32, §22C or 22D, each retirement system's unfunded accrued liability must be amortized (fully paid off) by 2028. There are two approaches to amortizing the

unfunded liability in a funding schedule: the level dollar approach and the increasing percent schedule approach.

Under the level dollar approach, during the life of the funding schedule, payments to amortize the unfunded liability remain level (the same) for each year, much like a mortgage. Under the increasing percent schedule approach, payments to amortize the unfunded liability increase by a set percentage (4.5% is the maximum allowed) each year. Under an increasing percentage schedule, the payment in the early years of the schedule is not large enough to even pay the interest on the outstanding principal.

A level dollar schedule is generally more conservative and will fund a system's unfunded liability more quickly than an increasing percent schedule. The level dollar is the approach required of private sector plans under federal law.

Retirement systems should submit funding schedules to PERAC for approval at least once every three years. If valuations are being performed annually or biennially, schedules may be submitted to PERAC more frequently. ◆

2. The Actuarial Valuation Cycle

GENERALLY, THE ACTUARIAL VALUATION CYCLE MAY BE CLASSIFIED INTO SIX PHASES:

- Preliminary Review
- Data Preparation
- Asset Preparation
- Valuation Specifications
- Valuation Run and Summary
- Final Report and Presentation

PRELIMINARY REVIEW

A preliminary review is common to all actuarial valuations. The actuary begins this phase by familiarizing himself or herself with the most recent prior valuation report for the retirement system, any actuarial work papers related to that report and the retirement system's correspondence file for the previous year. The actuarial work papers may have notes from the last valuation that would supply information on unusual aspects of the actuarial valuation. When reviewing last year's correspondence, the actuary will review any issues pertaining to the required annual appropriation.

DATA PREPARATION

A retirement system that is being valuated should submit active member and retiree data, in PERAC's required record layout to PERAC's Actuarial Unit, as soon as possible after the end of the calendar year. A January to mid-February submission of data, as of December 31 of the preceding year, is the most responsive. The goal is to produce valuation reports as early as possible in the year. The later in the year a report is issued, the less meaningful it may be.

It is essential that the retirement system furnishes the valuation team with accurate, up-to-date membership data. The date of birth, date of hire, salary, and amount of creditable service are a few of the crucial data elements for each active member. The date of birth, amount of monthly benefit and benefit option are a few of the crucial data elements for each retiree.

If a database has a large number of inaccuracies, the results of the valuation may be unreliable and the validity of the study questioned. An actuary may have to make assumptions as to dates of birth and hire, pay, and other missing information in order to complete a valuation. However, it is highly problematic when an actuary is faced with making estimates for a large number of missing or incorrect data elements. For example, if there are 500 active members, it is acceptable for an actuary to make estimates of pay or creditable service for a handful of members. But if the records of 100 members lack accurate values for one or both of these elements, the retirement board should clean up the data before the valuation is carried out. Actuaries generally make estimates cautiously; if estimates are utilized extensively, it is more likely that the actuarial liability will be overstated. An actuary can best determine a retirement system's true liability with accurate data.

LISTINGS OF QUESTIONABLE DATA ITEMS

When PERAC's Actuarial Unit reviews a retire-

ment system's membership data, it prepares listings of questionable data items. If data is erroneous, it is essential that corrections be made in the retirement board's database (not just in the copies of the files used by the actuarial team) so that the error(s) will not surface again in future data listings.

PERAC's actuarial software has been designed to provide warnings when certain data elements do not appear to match established criteria. The parameters that we use in our reasonableness tests do not change from year to year. For example, PERAC's system will flag the current payable amount for a retiree if the original amount of benefit plus COLAs does not equal the current amount payable. The warning may indeed be triggered by an erroneous entry for original amount of benefit. However, if the member has died and the beneficiary is receiving the benefit or a Section 90C benefit has been granted, the data provided may actually be correct. In such instances, the retirement board should simply annotate the data list, and review it with the actuary.

Retirement boards are encouraged to retain PERAC's data listings. Just as actuaries conduct a preliminary review of prior valuation reports before beginning a new valuation study, so should retirement boards conduct a review of prior year(s) data listing(s) before acting on data listings associated with a current valuation. Since PERAC may identify the same record or records as being questionable each year, retirement board staff can save time by referencing prior year's documentation. It may indeed tell the actuarial team that the same question(s) was raised about the same record(s) before and there is a valid explanation about why an entry that appears to be wrong is actually right.

Data clean up is a time-consuming, labor-intensive task—for both retirement board staff and actuaries. It can often represent as much as 75% of the total time involved in a valuation. PERAC strongly encourages retirement boards to maintain up-to-date, accurate membership databases. Retirement boards should consider periodically auditing their databases to identify missing and/or erroneous entries. Data maintenance should be viewed as an on-going responsibility rather than an isolated, annual or biennial project.

ASSET PREPARATION

This phase includes the following steps:

- Asset reconciliation
- Actuarial value of valuation assets development (if applicable)
- Determination of prior year asset gain or loss

The asset reconciliation phase consists of a review of the asset information presented in the Annual Statement. This phase includes a review of: the market value of assets by type of investment; allocations to the Annuity Savings Fund, the Annuity Reserve Fund, the Pension Fund, and the Pension Reserve Fund; benefit payments and appropriation amounts.

The assets of most retirement systems are currently being appraised at market value in actuarial valuations. In the past few years, PERAC has applied an actuarial value of assets methodology in its Actuarial Valuation Report for the Commonwealth's Total Pension Obligation. Several local retirement systems have adopted this technique or are currently reviewing it. Retirement boards should discuss both strategies with their actuaries. An actuarial value of assets methodology reduces the potential volatility in market value from year to year by recognizing gains and losses over a five-year (or other) period. The market value of assets can be erratic from one year to the next, but an actuarial value approach provides a smoothing technique. The actuarial value of assets will not increase as much as the market value in a good

year, or decrease as much as the market value in a bad year.

Asset gains and losses are determined by referring to the investment return assumption used in the most recent prior valuation. If, for the year currently being valuated, the actual value of assets exceeds the expected value of assets, there is an asset gain. If the actual value is less than the expected value of assets, there is an asset loss.

VALUATION SPECIFICATIONS

At the beginning of the valuation process, the actuary should make recommendations to the retirement board about the assumptions to be used in the current valuation. The actuary may advise the board to make changes in the assumptions that were used for the preceding valuation. After consulting with the actuary, the retirement board should make the final determination about the assumptions to be used.

At the beginning of the valuation process, the actuary should make recommendations to the retirement board about the assumptions to be used in the current valuation.

VALUATION RUN & SUMMARIZATION

After the data has been "cleaned," the actuary will run a valuation program that calculates and projects liabilities. The principal valuation results are summarized and the following items are computed and analyzed.

- Unfunded Accrued Liability: The actuarial accrued liability is composed of several items. For active members, this liability represents the present value of expected benefits at retirement (based on estimated pay and service and the retirement plan's benefit formula that is attributable to service rendered to date). For retirees, this liability includes the present value of payments that are expected to be made during the retiree's lifetime and that of his/her spouse, if applicable.

The actuarial accrued liability less the retirement plan assets produces the unfunded actuarial accrued liability.

- Amortization of past service liability
- Normal Cost: Normal cost or current cost is the present value of benefits that are expected to be earned during the current year.
- Comparison between current and prior valuations
- Gain and loss analysis

FINAL REPORT & PRESENTATION

The Actuary issues a report upon completing a valuation. The contents of a typical report are as follows:

- Introduction and Actuarial Certificate
- Summary discussion
- Comparison of results with prior valuation
- Summary of valuation results
- Appropriation development for the current fiscal year
- Funding schedule(s)
- Information required by Auditors—GASB 25 (Governmental Accounting Standards Board)
- Assets
- Summary of system membership characteristics
- Actuarial methods and assumptions
- Summary of plan provisions
- Glossary of actuarial valuation terms

The actuary meets with the board to present the valuation results. Generally, an actuary will include the following elements in his/her presentation:

- Results of the actuarial valuation

- Actuarial assumptions and methods
- Discussion of terms used in the valuation
- Discussion of alternatives funding schedules

and/or strategies.

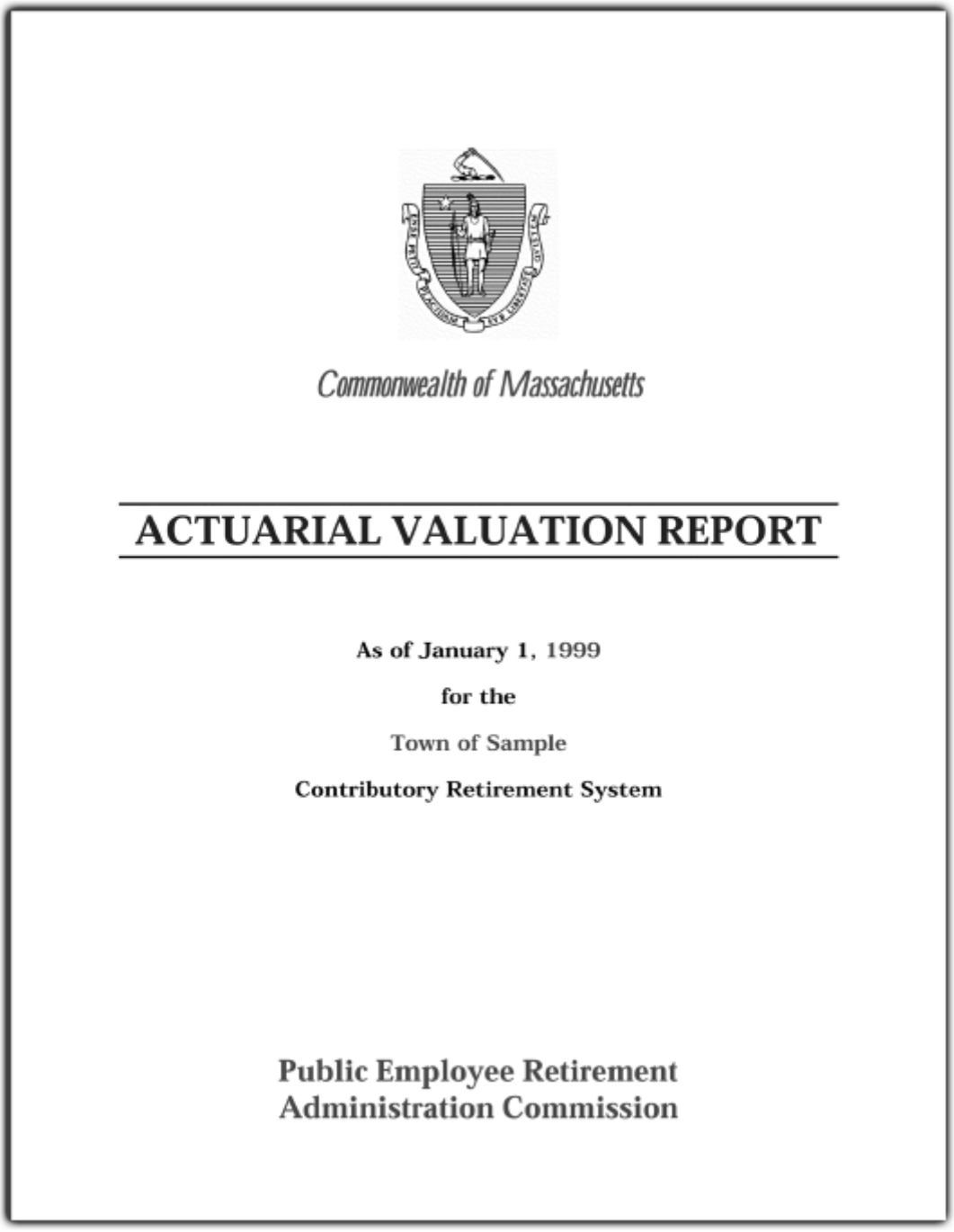
Since the final report represents a completed stand-alone document until the next valuation is conducted, retirement board members should be sure that their questions about the draft report are answered in a satisfactory manner. Retirement board members are more aware of their membership and system characteristics than either PERAC or any private actuary can be. It is incumbent upon them to raise questions about any aspect of the report that they find to be incorrect, confusing or vague.

POSTING VALUATION STUDIES ON PERAC'S HOME PAGE

Our goal is to make comprehensive pension information available to the active and retired public employees of Massachusetts and to professionals involved with retirement issues via PERAC's Home Page: www.state.ma.us/PERAC. As part of this initiative, PERAC's Communications Unit posts valuation studies, along with other information in the Board Profile section of our Home Page.

Upon your receipt of a finalized, hard copy of any actuarial study completed by a private actuary in 1999 and thereafter, please ensure that an electronic copy of it is forwarded to PERAC's Communications Unit. It is important that the information is transmitted to PERAC in a timely fashion, since the more up-to-date the information is, the more valuable it will be to our Web visitors. These files may be transmitted on cassette tapes, 3 ¼ inch diskettes, or as attachments to e-mails. We can work with Word, Word Perfect and EXCEL documents or any combination thereof. ◆

3. A Sample Actuarial Valuation Report



Commonwealth of Massachusetts

ACTUARIAL VALUATION REPORT

As of January 1, 1999

for the

Town of Sample

Contributory Retirement System

Public Employee Retirement
Administration Commission

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ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION I
INTRODUCTION AND CERTIFICATION

This report presents the results of the actuarial valuation of the Contributory Retirement System. The valuation was performed as of January 1, 1999 pursuant to Chapter 32 of the General Laws of the Commonwealth of Massachusetts.

It is our opinion that the actuarial assumptions used in this report are each reasonably related to plan experience and expectations and represent our best estimate of anticipated experience under the system.

This valuation was based on member data as of December 31, 1998 which was supplied by the retirement board. Such tests as we deemed necessary were performed on the data to ensure accuracy. Asset information as of December 31, 1998 was provided in the Annual Statement for the Financial Condition as submitted to this office in accordance with G.L. c. 32, ss. 20(5)(h), 23(1)(c) and 23(2)(e).

In our opinion, this report represents an accurate appraisal of the actuarial status of the Contributory Retirement System performed in accordance with generally accepted actuarial principles and practices relating to pension plans.

Respectfully submitted,
Public Employee Retirement
Administration Commission

JAMES R. LAMENZO
Member of the American Academy of Actuaries
Associate of the Society of Actuaries
Enrolled Actuary Number 99-4709

Joseph E. Connarton
Executive Director

Dated: October 1, 1999

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ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION II
SUMMARY DISCUSSION

PART A Costs under Current Valuation

The results of the January 1, 1999 actuarial valuation are as follows:

Total Normal Cost	$2,000,000
Employee Contributions	1,100,000
Net Normal Cost	$900,000
Total Actuarial Liability	$72,700,000
Assets	43,600,000
Unfunded Actuarial Liability	$29,100,000

Please see page 6 for more detail of these amounts.

The most recent funding schedule was effective in FY99. The appropriation for FY00 under the System's approved funding schedule, based upon the results of this valuation, is shown below.

1 22(D) Funding Schedule for the Fiscal Yr. beginning July 1, 1999

	DOLLAR AMOUNT	PERCENT OF PAYROLL
Normal Cost (adjusted for payment date)	$972,000	6.9%
Additional Administrative Expenses	50,000	0.3%
Amortization Amounts		
Unfunded Actuarial Liability		
29 year 4.5% increasing	1,655,000	11.7%
Total Cost	$2,677,000	18.9%

2 Alternative Funding Schedule for the Fiscal Yr. beginning July 1, 1999

	DOLLAR AMOUNT	PERCENT OF PAYROLL
Normal Cost (adjusted for payment date)	$972,000	6.9%
Additional Administrative Expenses	50,000	0.3%
Amortization Amounts		
Unfunded Actuarial Liability		
29 year 2.5% increasing	2,051,000	14.5%
Total Cost	$3,073,000	21.7%

All amounts assume appropriations will be made January 1.

2

- Pages 2, 3, and 4 are the Executive Summary. More detail is reflected in the other sections.
- Typically, the current schedule [1] and an alternative schedule [2] are shown in our reports.

ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION II
SUMMARY DISCUSSION (Continued)

PART B Comparison with Prior Valuation

The last full valuation was performed by PERA as of January 1, 1996. The calculations in both reports were based on similar assumptions, except the 1983 Group Annuity Mortality table was used for this valuation. Below we have shown the comparison between the PERA valuation as of January 1, 1996 and the valuation completed by PERAC as of January 1, 1999 ($000's omitted).

	PERAC 1/1/99	PERA 1/1/96	Increase (Decrease)	Increase (Decrease)
Total Normal Cost	$2,020	$1,500	$ 520	34.7%
Employee Contributions	1,100	850	250	29.4%
Net Normal Cost	$900	$650	$250	38.5%
Actuarial Liability				
Actives	$40,000	$30,000	$10,000	33.3%
Retirees and Inactives	32,700	24,000	8,700	36.3%
Total	$72,700	$54,000	$18,700	34.6%
Assets	43,600	28,200	15,400	54.6%
Unfunded Actuarial Liability	**$29,100**	**$25,800**	**$3,300**	**12.8%**
Funded Ratio	**60.0%**	**52.2%**	**7.8%**	

1

We have shown below a comparison of the number of members, payroll amounts, average age and average service.

	PERAC 1/1/99	PERA 1/1/96	% Difference
Actives			
Number	410	390	4.9%
Total Payroll	$14,162,000	$11,737,000	20.7%
Average Salary	$34,543	$30,094	14.8%
Average Age	47.9	47.7	0.4%
Average Service	11.7	11.7	0.0%

2

3

1 Note that the funded ratio increased yet the unfunded liability also increased over the 3-year period.

2 Increases in pay greater than assumed produce actuarial losses. Likewise increases in pay less than assumed produce actuarial gains. Gains and losses due to salary changes are usually the most significant non-asset related gains and losses.

ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION II
SUMMARY DISCUSSION (Continued)

PART B Comparison with Prior Valuation (continued)

	PERAC 1/1/99	PERA 1/1/96	% Difference
Retirees and Survivors			
Number	330	340	(2.9%)
Total Benefits*	$3,904,535	$3,672,244	6.3%
Average Benefits*	$11,832	$10,801	9.5%
Average Age	73.2	72.4	1.1%

*excluding State reimbursed COLA

1

Since the system has adopted Chapter 17, the 1998 valuation amounts reflect the impact of the COLA legislation. The figures for the prior valuation do not reflect this cost.

The costs based on this valuation are about the same as expected (before taking into account the change in mortality table and the COLA legislation).

PART C Considerations for the Future

In the past year, the System accepted the COLA legislation. The funding schedule presented reflects this impact. This schedule amortizes the unfunded actuarial liability over 29 years with payments increasing 4.5% per year. The Board adopted this schedule recently.

We have also shown a schedule assuming with payments amortizing the unfunded liability increasing 2.5% per year.

Chapter 17 of the Acts of 1997 revised the manner in which Cost of Living Adjustments (COLA) are granted to public pension retirees. If a system adopts the COLA provisions and the Retirement Board approves a COLA for a given year, all retirees of the system would receive annual COLA increases up to 3.0% based on the Consumer Price Index used in determining Cost of Living Adjustments under Social Security.

The basis on which the COLA will be applied is $12,000. The system would pay for any COLA granted after 1997.

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1 A discussion of plan experience since the last year is shown here.

ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION II
SUMMARY DISCUSSION (Continued)

PART D Other Information Available in this Report

The valuation results by type of benefit are on page 6. On page 7 is the development of the required appropriation amounts. The current funding schedule based on the Retirement Board's acceptance of section 22D is on page 8. On page 9 there is an alternative Amortization Funding Schedule.

For purposes of filing financial statements, the Governmental Accounting Standards Board (GASB) issued Statement No. 25 in November, 1994. The requirements of statement 25 are effective for periods beginning after June 15, 1996. The actuarial information required by this statement is on page 10 of this report.

In addition, we have included a summary of asset information on page 11. For purposes of developing the Unfunded Actuarial Liability, we have used the market value of assets. In future years, an actuarial value of assets will be established consisting of a five-year average of market values. This will serve to reflect market values, but will moderate the fluctuations that can occur if an unadjusted market value is used each year.

On pages 12 to 15, demographic information regarding the members of the Contributory Retirement System is presented. These charts display age, service and salary information for active members and age and benefit information for retirees and survivors.

A description of the funding method used in calculating valuation results is on page 16, and the actuarial assumptions used are on pages 17 and 18.

A brief summary of plan provisions appears on pages 19 to 23, followed by a glossary of actuarial terminology on pages 24 to 25.

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ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION III
SUMMARY OF VALUATION RESULTS ($000's omitted)

A. Number of Members on Current Valuation Date		
1. Active Members		410
2. Vested Terminated Members		10
3. Retired Members and Survivors		330
Total		750
B. Total Regular Compensation of Active Members		$14,162
C. Normal Cost		
1. Superannuation		$1,300
2. Termination		150
3. Disability		350
4. Death		200
Total Normal Cost		$2,000
Employee Contribution		1,100
Net Employer Normal Cost		$900
D. Actuarial Liability		
1. Superannuation		$32,600
2. Termination		1,300
3. Disability		4,200
4. Death		1,900
Total Actives		$40,000
Vested Terminated Members		2,000
Non-Vested Terminated Members		700
Retirees and Survivors		30,000
Total Actuarial Liability		$72,700
Assets		43,600
Unfunded Actuarial Liability		$29,100
Funded Ratio (Ratio of Assets to Actuarial Liability)		60.0%

6

1 Normal cost for a member reflects the estimated present value of benefits accruing during the year of the valuation. The total normal cost is the sum of normal costs for all active members.

2 The total normal cost is reduced by the expected amount of employee contributions for the year of the valuation to determine the employer or system normal cost.

3 The actuarial liability for active members essentially represents the present value of future benefits expected under the plan based on a member's service to date.

ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION III
SUMMARY OF VALUATION RESULTS ($000's omitted)

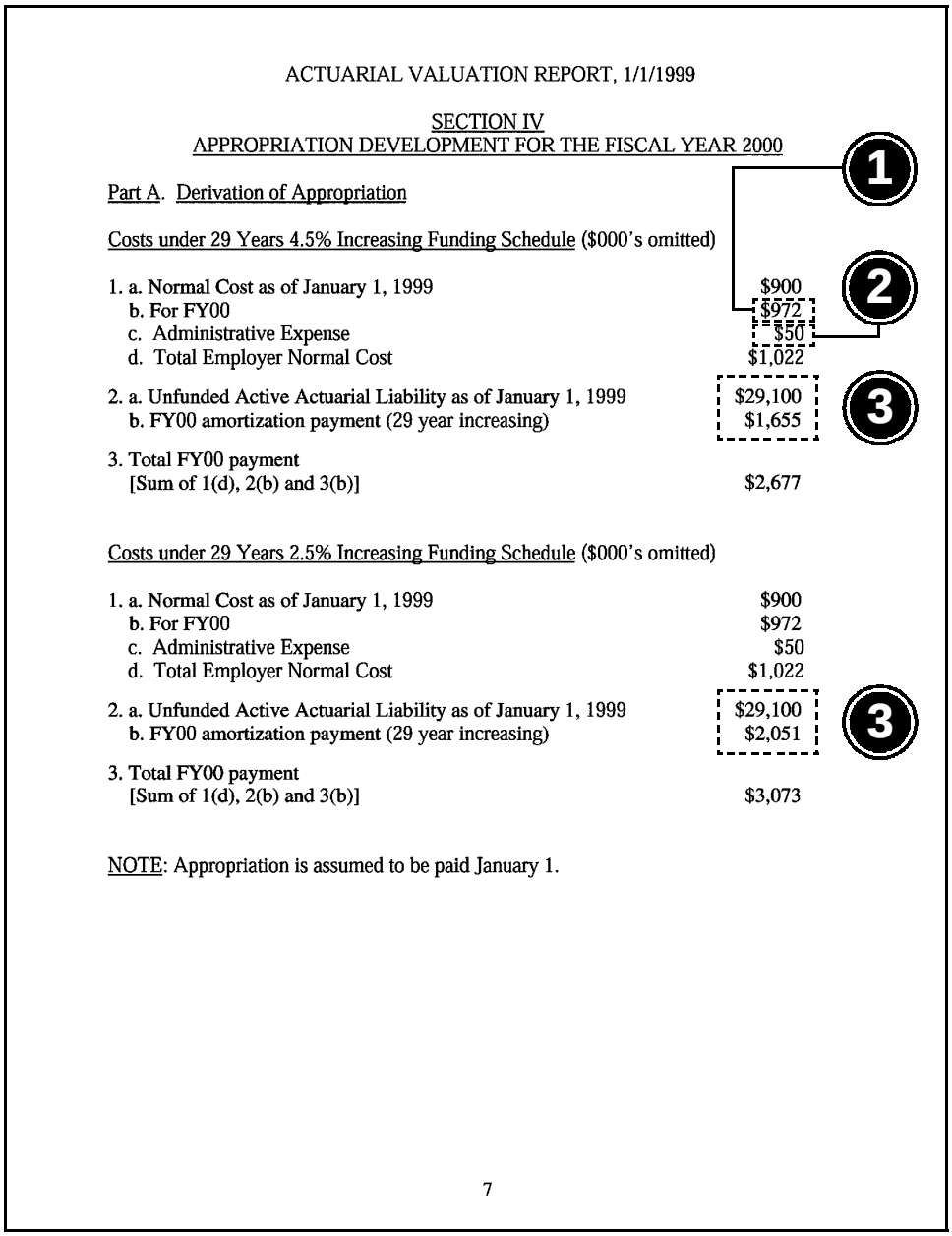
A. Number of Members on Current Valuation Date	
1. Active Members	410
2. Vested Terminated Members	10
3. Retired Members and Survivors	330
Total	750
B. Total Regular Compensation of Active Members	$14,162
C. Normal Cost	
1. Superannuation	$1,300
2. Termination	150
3. Disability	350
4. Death	200
Total Normal Cost	$2,000
Employee Contribution	1,100
Net Employer Normal Cost	$900
D. Actuarial Liability	
1. Superannuation	$32,600
2. Termination	1,300
3. Disability	4,200
4. Death	1,900
Total Actives	$40,000
Vested Terminated Members	2,000
Non-Vested Terminated Members	700
Retirees and Survivors	30,000
Total Actuarial Liability	$72,700
Assets	43,600
Unfunded Actuarial Liability	$29,100
Funded Ratio (Ratio of Assets to Actuarial Liability)	60.0%

6

4 The actuarial liability of retired members is the present value of benefits expected to be paid based on the benefit option, the age of the retiree, and the interest rate and mortality table used in the valuation.

5 The Actuarial Accrued Liability less plan Assets equals Unfunded Actuarial Accrued Liability.

6 The funded ratio equals plan Assets divided by Actuarial Accrued Liability.



ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION IV
APPROPRIATION DEVELOPMENT FOR THE FISCAL YEAR 2000

Part A. Derivation of Appropriation

Costs under 29 Years 4.5% Increasing Funding Schedule ($000's omitted)

1. a. Normal Cost as of January 1, 1999	$900
b. For FY00	$972
c. Administrative Expense	$50
d. Total Employer Normal Cost	$1,022
2. a. Unfunded Active Actuarial Liability as of January 1, 1999	$29,100
b. FY00 amortization payment (29 year increasing)	$1,655
3. Total FY00 payment [Sum of 1(d), 2(b) and 3(b)]	$2,677

Costs under 29 Years 2.5% Increasing Funding Schedule ($000's omitted)

1. a. Normal Cost as of January 1, 1999	$900
b. For FY00	$972
c. Administrative Expense	$50
d. Total Employer Normal Cost	$1,022
2. a. Unfunded Active Actuarial Liability as of January 1, 1999	$29,100
b. FY00 amortization payment (29 year increasing)	$2,051
3. Total FY00 payment [Sum of 1(d), 2(b) and 3(b)]	$3,073

NOTE: Appropriation is assumed to be paid January 1.

7

1 Credited with interest to date of payment (in this case from 1/1/98 to 1/1/99 at 8.0%).

2 Reflects estimated System administrative expense not including investment related expenses.

3 Full amortization schedules are shown on pages 8 and 9.

ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION IV
APPROPRIATION DEVELOPMENT FOR THE FISCAL YEAR 2000 (Continued)

Part B 29 years 4.5% Increasing Amortization Funding Schedule

Fiscal Year	Normal Cost	Amort. Of U.A.L.	Total Cost	BOFY Balance
2000	1,022,000	1,655,000	2,677,000	30,264,000
2001	1,078,000	1,729,000	2,807,000	30,964,000
2002	1,137,000	1,807,000	2,944,000	31,643,000
2003	1,200,000	1,888,000	3,088,000	32,295,000
2004	1,266,000	1,973,000	3,239,000	32,915,000
2005	1,336,000	2,062,000	3,398,000	33,496,000
2006	1,409,000	2,155,000	3,564,000	34,031,000
2007	1,486,000	2,252,000	3,738,000	34,512,000
2008	1,568,000	2,353,000	3,921,000	34,931,000
2009	1,654,000	2,459,000	4,113,000	35,278,000
2010	1,745,000	2,570,000	4,315,000	35,543,000
2011	1,841,000	2,686,000	4,527,000	35,714,000
2012	1,942,000	2,807,000	4,749,000	35,778,000
2013	2,049,000	2,933,000	4,982,000	35,721,000
2014	2,162,000	3,065,000	5,227,000	35,528,000
2015	2,281,000	3,203,000	5,484,000	35,183,000
2016	2,406,000	3,347,000	5,753,000	34,667,000
2017	2,538,000	3,498,000	6,036,000	33,959,000
2018	2,678,000	3,655,000	6,333,000	33,038,000
2019	2,825,000	3,819,000	6,644,000	31,880,000
2020	2,980,000	3,991,000	6,971,000	30,459,000
2021	3,144,000	4,171,000	7,315,000	28,745,000
2022	3,317,000	4,359,000	7,676,000	26,707,000
2023	3,499,000	4,555,000	8,054,000	24,310,000
2024	3,691,000	4,760,000	8,451,000	21,518,000
2025	3,894,000	4,974,000	8,868,000	18,289,000
2026	4,108,000	5,198,000	9,306,000	14,579,000
2027	4,334,000	5,432,000	9,766,000	10,339,000
2028	4,572,000	5,676,000	10,248,000	5,517,000
2029	4,823,000		4,823,000	0

1

All amounts assume payments will be made January 1 of each fiscal year

2

8

1 Normal cost assumed to increase 5.5% per year in this exhibit (same rate as salary scale assumption).

2 Under an increasing schedule, the outstanding balance actually increases for a period of time, before decreasing and being extinguished in 2028. The reason for this is that in the early years, the payments are not large enough to pay the interest on the outstanding balance.

ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION IV
APPROPRIATION DEVELOPMENT FOR THE FISCAL YEAR 2000 (Continued)

Part C 29 years 2.5% Increasing Amortization Funding Schedule

Fiscal Year	Normal Cost	Amort. Of U.A.L.	Total Cost	BOFY Balance
2000	1,022,000	2,051,000	3,073,000	30,264,000
2001	1,078,000	2,102,000	3,180,000	30,552,000
2002	1,137,000	2,155,000	3,292,000	30,810,000
2003	1,200,000	2,209,000	3,409,000	31,034,000
2004	1,266,000	2,264,000	3,530,000	31,219,000
2005	1,336,000	2,321,000	3,657,000	31,362,000
2006	1,409,000	2,379,000	3,788,000	31,457,000
2007	1,486,000	2,438,000	3,924,000	31,499,000
2008	1,568,000	2,499,000	4,067,000	31,483,000
2009	1,654,000	2,561,000	4,215,000	31,403,000
2010	1,745,000	2,625,000	4,370,000	31,252,000
2011	1,841,000	2,691,000	4,532,000	31,022,000
2012	1,942,000	2,758,000	4,700,000	30,705,000
2013	2,049,000	2,827,000	4,876,000	30,293,000
2014	2,162,000	2,898,000	5,060,000	29,776,000
2015	2,281,000	2,970,000	5,251,000	29,144,000
2016	2,406,000	3,044,000	5,450,000	28,387,000
2017	2,538,000	3,120,000	5,658,000	27,492,000
2018	2,678,000	3,198,000	5,876,000	26,447,000
2019	2,825,000	3,278,000	6,103,000	25,237,000
2020	2,980,000	3,360,000	6,340,000	23,847,000
2021	3,144,000	3,444,000	6,588,000	22,260,000
2022	3,317,000	3,530,000	6,847,000	20,459,000
2023	3,499,000	3,618,000	7,117,000	18,425,000
2024	3,691,000	3,708,000	7,399,000	16,136,000
2025	3,894,000	3,801,000	7,695,000	13,571,000
2026	4,108,000	3,896,000	8,004,000	10,704,000
2027	4,334,000	3,993,000	8,327,000	7,508,000
2028	4,572,000	4,093,000	8,665,000	3,956,000
2029	4,823,000		4,823,000	0

All amounts assume payments will be made January 1 of each fiscal year

1

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1 Note that under this schedule, the appropriation amount is greater than the schedule on the preceding page until 2012. After that date, this funding schedule has a lesser appropriation amount.

ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION V
GASB STATEMENT NO. 25 - ACTUARIAL INFORMATION

In November of 1994, GASB issued Statements No. 25, 26 and 27, relating to Financial Reporting and Accounting for Pension Plans. We have included in this report the actuarial information required by Statement No. 25. The requirements of Statement 25 are effective for periods beginning after June 15, 1996.

SCHEDULE OF FUNDING PROGRESS

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL)* (b)	Unfunded AAL (UAAL) (b-a)	Funded Ratio (a/b)	Covered Payroll (c)	UAAL as a % of Cov. Payroll ((b-a)/c)
1/1/99	$43,600,000	$72,700,000	$29,100,000	60.0%	$14,200,000	204.9%
1/196	$28,200,000	$54,000,000	$25,800,000	52.2%	$11,700,000	220.5%
1/1/93	$22,800,000	$44,000,000	$21,300,000	51.8%	$10,500,000	202.9%

*excludes State reimbursed COLA

NOTES TO SCHEDULES

Additional information as of the latest actuarial valuation follows:

Valuation Date	January 1, 1999
Actuarial Cost Method	Individual entry age normal
Amortization method	4.5% increasing payments
Remaining amortization period	29 years
Asset valuation method	Market value
Actuarial assumptions:	
Investment rate of return	8.0%
Projected salary increases	5.5%

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- GASB 25 disclosures superseded GASB 5 in 1997.

ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION VI
ASSETS 12/31/98

A. Breakdown of Assets by Investment Type

Type	
Cash and Cash Equivalents	$6,200,000
Fixed Income Securities (Book Value)	17,400,000
Equities (Market Value)	16,700,000
Mutual or Commingled R/E Fund	100,000
International Investments	2,300,000
Interest Due and Accrued	300,000
TOTAL	$43,000,000

B. Breakdown of Assets by Fund

Annuity Savings Fund	$11,300,000
Annuity Reserve Fund	4,800,000
Military Service Fund	2,000
Pension Fund	10,300,000
Pension Reserve Fund	16,598,000
TOTAL	$43,000,000

C. Market Value of Assets $43,600,000

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- Plan assets here are valued at market value. Assets may also be valued by phasing in gains or losses over a period of time (5 years, for example) so that all gains and losses occurring 5 or more years ago are fully recognized. This methodology is used to reduce the potential volatility in the market value approach. This methodology is commonly used in the private sector.

ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION VII
INFORMATION ON SYSTEM MEMBERSHIP

A critical element of an actuarial valuation is accurate and up-to-date membership information. PERAC conducted an extensive review of actual member information submitted as of 12/31/98 by Retirement Board.

Part A Active Members

	Actives	Vested Terms.
Number of Members	410	10
Average Age	47.9	53.9
Average Service	11.7	15.6
Average Salary	$34,543	$15,114
Average Annuity Savings Fund Balance	$27,294	$17,415

Age by Service Distribution of Active Members

Years of Service

Present Age	*0 - 4*	*5 -9*	*10 - 14*	*15 - 19*	*20 - 24*	*25 - 29*	*30 +*	**Total**
0-24	9							9
25-29	18							18
30-34	10	5	12					27
35-39	25	5	6	3				39
40-44	15	12	13	11	4			55
45-49	15	10	18	12	5	9		69
50-54	15	11	21	8	11	12	3	81
55-59	10	4	15	7	8	3	15	62
60-64	4	2	7	5	3	2	3	26
65 +	2	3	4	3	6	2	4	24
Total	123	52	96	49	37	28	25	410

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ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION VII
INFORMATION ON SYSTEM MEMBERSHIP (Continued)

Part A Active Members (continued)

Salary by Age Distribution of Active Members

Present Age	*Number of Participants*	*Total Salary*	*Average Salary*
0 - 24	9	$204,211	$22,690
25 - 29	18	$614,830	$34,157
30 - 34	27	$1,050,767	$38,917
35 - 39	39	$1,428,907	$36,639
	1*	$30,516	$30,516
40 - 44	55	$1,888,687	$34,340
45 - 49	69	$2,323,593	$33,675
	1*	$7,193	$7,193
50 - 54	81	$2,900,664	$35,811
	3*	$49,718	$16,573
55 - 59	62	$2,271,914	$36,644
	4*	$49,303	$12,326
60 - 64	26	$876,896	$33,727
	1*	$14,400	$14,400
65 +	24	$601,957	$25,082
Total	410	$14,162,426	$34,543
	10*	$151,130	$15,114

* Vested Terminated Members

Actual Employee Contributions made during 1998: $1,045,604

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ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION VII
INFORMATION ON SYSTEM MEMBERSHIP (Continued)

Part B Retirees and Survivors

	Superannuation	*Accidental Disability*	*Ordinary Disability*	*Survivors*	**Total**
Number of Members	230	28	9	63	330
Average Age	74	63	67	76	73
Avg. Annual Benefit	$12,594	$25,134	$20,347	$8,564	$13,100

Benefit by Payment and Retirement Type

	Superannuation	*Accidental Disability*	*Ordinary Disability*	*Survivors*	**Total**
Total Annuity	$447,815	$47,172	$16,771	$59,257	$571,015
Pension from Melrose	2,181,918	605,981	150,373	393,484	3,331,756
Pension from Other Systems	1,453	0	311	0	1,764
COLA	265,422	50,603	15,666	86,816	418,507
Total	$2,896,608	$703,756	$183,121	$539,557	$4,323,042

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ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION VII
INFORMATION ON SYSTEM MEMBERSHIP (Continued)

Part B Retirees and Survivors (continued)

Benefit by Age Distribution

Present Age	*Number of Members*	*Total Benefits*	*Average Benefits*
less than 40	N/A	N/A	N/A
40 -44	3	$60,822	$20,274
45 - 49	1	$50,866	$50,866
50 - 54	8	$263,222	$32,903
55 - 59	16	$376,058	$23,504
60 - 64	32	$589,681	$18,428
65 - 69	47	$608,229	$12,941
70 - 74	65	$1,023,990	$15,754
75 - 79	76	$787,000	$10,355
80 - 84	37	$287,791	$7,778
85 - 89	31	$201,654	$6,505
90 +	14	$73,729	$5,266
Totals	330	$4,323,042	$13,100

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ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION VIII
VALUATION COST METHODS

Part A Actuarial Cost Method

The Actuarial Cost Method which was used to determine pension liabilities and costs for benefits payable for the Contributory Retirement System for the year beginning January 1, 1999, is known as the Entry Age Normal Cost Method. Under this method the Normal Cost for each active participant on the valuation date is determined as the level percent of salary, which, if paid annually from the date the participant first became a member of the retirement system, would fully fund by retirement, death, disability or termination, the projected benefits which the participant is expected to receive. The Actuarial Liability for each participant is determined as the present value as of the valuation date of all projected benefits which the participant is expected to receive, minus the present value of future annual Normal Cost payments expected to be made to the fund. Since only active members have a Normal Cost, the Actuarial Liability for inactives, retirees and survivors is simply equal to the present value of all projected benefits. The sum of Normal Cost and Actuarial Liability for each participant is equal to the Normal Cost and Actuarial Liability for the Plan. The Unfunded Actuarial Liability is the Actuarial Liability minus current assets.

The Normal Cost for a participant will remain a level percent of salary for each year of participation except for changes in provisions of the Plan or the actuarial assumptions employed in projection of benefits and present value determinations. The Normal Cost for the entire system will also change due to addition of new participants or the retirement, death or termination of participants. The Actuarial Liability for a participant will increase each year to reflect the additional accrual of Normal Cost. It will also change if the Plan provisions or actuarial assumptions are changed.

Differences each year between the actual experience of the Plan and the experience projected by the actuarial assumptions are reflected by adjustments to the Unfunded Actuarial Liability. An experience difference which increases the Unfunded Actuarial Liability is called an Actuarial Loss and one which decreases the Unfunded Actuarial Liability is called an Actuarial Gain.

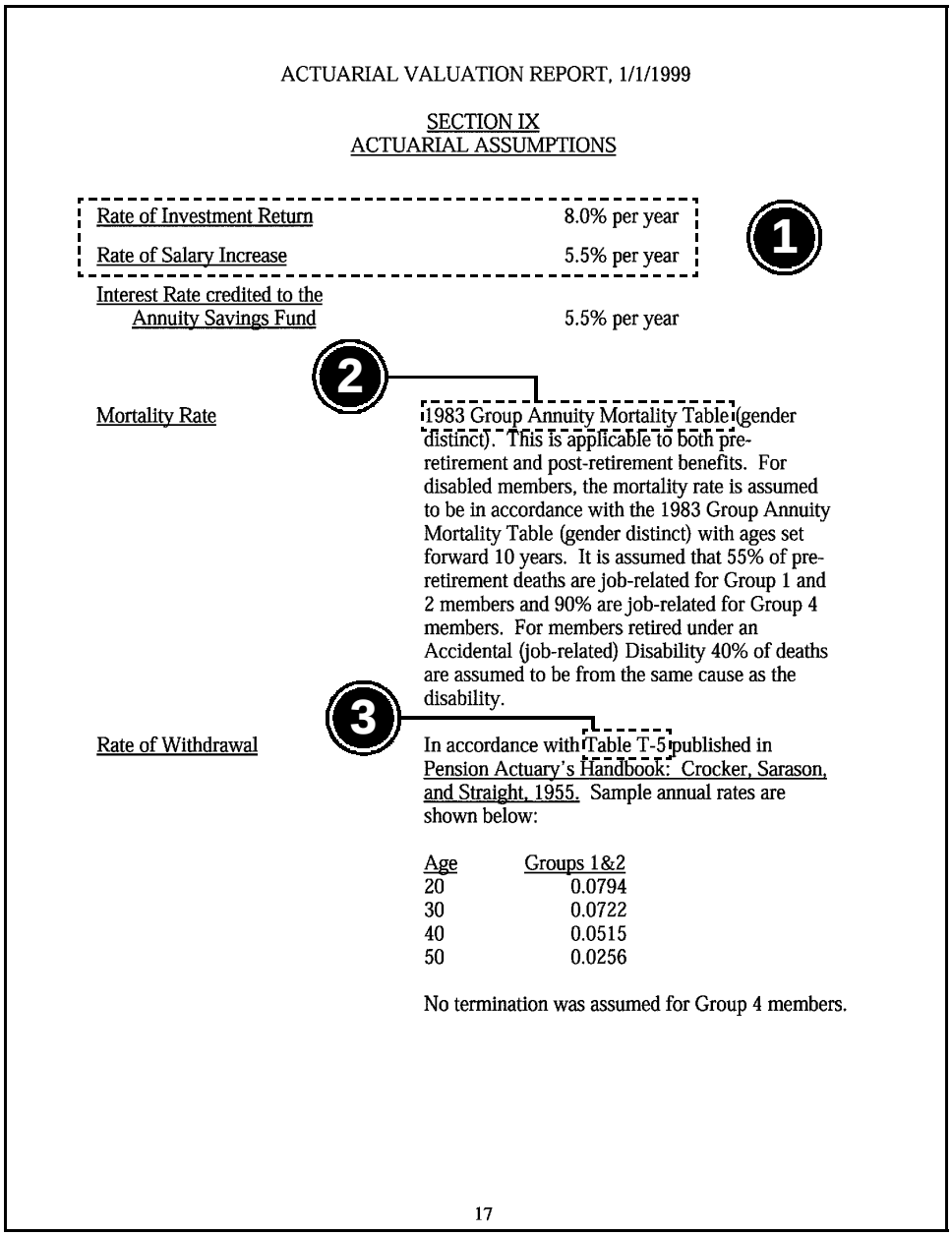
Part B Asset Valuation Method

Assets are at market value.

16

1 Determined by statute.

2 Board should consider an actuarial value approach in future valuations.



ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION IX
ACTUARIAL ASSUMPTIONS

Rate of Investment Return	8.0% per year
Rate of Salary Increase	5.5% per year
Interest Rate credited to the Annuity Savings Fund	5.5% per year

1

Mortality Rate — 1983 Group Annuity Mortality Table (gender distinct). This is applicable to both pre-retirement and post-retirement benefits. For disabled members, the mortality rate is assumed to be in accordance with the 1983 Group Annuity Mortality Table (gender distinct) with ages set forward 10 years. It is assumed that 55% of pre-retirement deaths are job-related for Group 1 and 2 members and 90% are job-related for Group 4 members. For members retired under an Accidental (job-related) Disability 40% of deaths are assumed to be from the same cause as the disability.

2

Rate of Withdrawal — In accordance with Table T-5 published in Pension Actuary's Handbook: Crocker, Sarason, and Straight, 1955. Sample annual rates are shown below:

Age	Groups 1&2
20	0.0794
30	0.0722
40	0.0515
50	0.0256

No termination was assumed for Group 4 members.

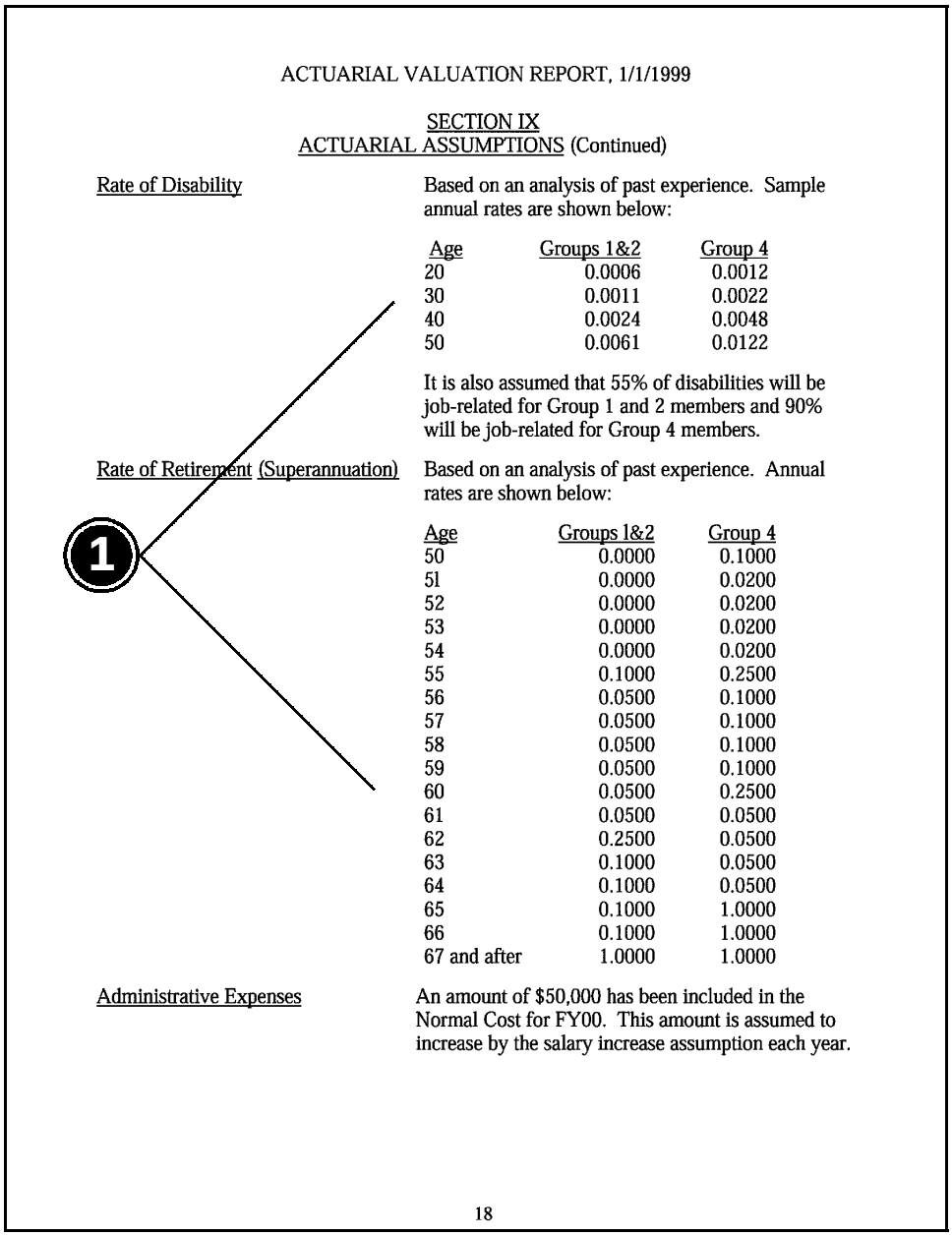
17

3

1 Principal economic assumptions.

2 Revised beginning in 1997 PERAC valuations to reflect current life expectancies.

3 Reflects moderate turnover.



ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION IX
ACTUARIAL ASSUMPTIONS (Continued)

Rate of Disability

Based on an analysis of past experience. Sample annual rates are shown below:

Age	Groups 1&2	Group 4
20	0.0006	0.0012
30	0.0011	0.0022
40	0.0024	0.0048
50	0.0061	0.0122

It is also assumed that 55% of disabilities will be job-related for Group 1 and 2 members and 90% will be job-related for Group 4 members.

Rate of Retirement (Superannuation)

Based on an analysis of past experience. Annual rates are shown below:

Age	Groups 1&2	Group 4
50	0.0000	0.1000
51	0.0000	0.0200
52	0.0000	0.0200
53	0.0000	0.0200
54	0.0000	0.0200
55	0.1000	0.2500
56	0.0500	0.1000
57	0.0500	0.1000
58	0.0500	0.1000
59	0.0500	0.1000
60	0.0500	0.2500
61	0.0500	0.0500
62	0.2500	0.0500
63	0.1000	0.0500
64	0.1000	0.0500
65	0.1000	1.0000
66	0.1000	1.0000
67 and after	1.0000	1.0000

Administrative Expenses

An amount of $50,000 has been included in the Normal Cost for FY00. This amount is assumed to increase by the salary increase assumption each year.

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1 Reflects the PERAC standard assumption set. We hope to revise these based on actual experience within the next two years.

ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION X
SUMMARY OF PLAN PROVISIONS

ADMINISTRATION : There are 106 contributory Retirement Systems for public employees in Massachusetts. Each system is governed by a retirement board and all boards, although operating independently, are governed by one retirement law, Chapter 32 of the Massachusetts General Laws. This law in general provides uniform benefits, uniform contribution requirements and a uniform accounting and funds structure for all systems.

PARTICIPATION : Participation is mandatory for all full-time employees. Eligibility with respect to part-time, provisional, temporary, seasonal or intermittent employment is governed by regulations promulgated by the retirement board, and approved by PERAC. Membership is optional for certain elected officials.

There are 3 classes of membership in the Retirement System:

Group 1 - General employees, including clerical, administrative, technical and all other employees not otherwise classified.

Group 2 - Certain specified hazardous duty positions.

Group 4 - Police officers, firefighters, and other specified hazardous positions.

MEMBER CONTRIBUTIONS : Member contributions vary depending on the most recent date of membership:

Prior to 1975 - 5% of regular compensation
1975 - 1983 -7% of regular compensation
1984 to 6/30/96 - 8% of regular compensation
7/1/96 to present - 9% of regular compensation
1979 to present - an additional 2% of regular compensation in excess of $30,000.

RATE OF INTEREST : Regular Interest on regular deductions made after January 1, 1984 is a rate established by PERAC in consultation with the Commissioner of Banks. The rate is obtained from the average rates paid on individual savings accounts by a representative sample of at least 10 financial institutions.

RETIREMENT AGE : The mandatory retirement age for some Group 2 and Group 4 employees is age 65. Most Group 2 and Group 4 members may remain in service after reaching age 65. Group 4 members who are employed in certain public safety positions are required to retire at age 65. There is no mandatory retirement age for employees in Group 1.

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ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION X
SUMMARY OF PLAN PROVISIONS (Continued)

SUPERANNUATION RETIREMENT : A member is eligible for a superannuation retirement allowance (service retirement), upon meeting the following conditions:

completion of 20 years of service, or

attainment of age 55 if hired prior to 1978, or if classified in Group 4, or

hired after 1978, with 10 years of service and age 55.

AMOUNT OF BENEFIT : A member's annual allowance is determined by multiplying average salary by a benefit rate related to the member's age and job classification at retirement, and the resulting product by his creditable service. The amount determined by the benefit formula cannot exceed 80% of the employees' highest three year average salary. For veterans as defined in G.L. c. 32, s. 1, there is an additional benefit of $15 per year for each year of creditable service, up to a maximum of 20 years.

Salary is defined as gross regular compensation.

Average Salary is the average annual rate of regular compensation received during the 3 consecutive years that produce the highest average, or, if greater, during the last three years (whether or not consecutive) preceding retirement.

The Benefit Rate varies with the member's retirement age, but the highest rate of 2.5% applies to Group 1 employees who retire at or after age 65, Group 2 employees who retire at or after age 60, and to Group 4 employees who retire at or after age 55. A .1% reduction is applied for each year of age under the maximum age for the member's group. For Group 2 employees who terminate from service under age 55, the benefit rate for a Group 1 employee shall be used.

DEFERRED VESTED BENEFIT : A participant who has completed 10 or more years of creditable service is eligible for a deferred vested retirement benefit. Elected officials and others who were hired prior to 1978 may be vested after 6 years in accordance with G.L. c. 32, s. 10.

The participant's accrued benefit is payable commencing at age 55, or the completion of 20 years, or may be deferred until later at the participant's option.

WITHDRAWAL OF CONTRIBUTIONS : If a member is under age 55, member contributions may be withdrawn upon termination of employment. Employees who first become members on or after January 1, 1984, may receive only limited interest on their contributions if they voluntarily terminate their service. Those who leave service with less than 5 years receive no interest; those who leave service with greater than 5 but less than 10 years receive 50% of interest.

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ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION X
SUMMARY OF PLAN PROVISIONS (Continued)

DISABILITY RETIREMENT : The Massachusetts Retirement Plan provides 2 types of disability retirement benefits:

Ordinary Disability:

Eligibility: Non-veterans who become totally and permanently disabled by reason of a non-job related condition before attaining age 55 with at least 10 years of creditable service (or 15 years creditable service in systems in which the local option contained in G.L. c. 32, s.6(1) has not been adopted).

Veterans with ten years of creditable service who become totally and permanently disabled by reason of a non-job related condition prior to reaching "maximum age".

Retirement Allowance: Equal to the accrued superannuation retirement benefit as if the member was age 55. If the member is a veteran, the benefit is 50% of the member's final rate of salary during the preceding 12 months, plus an annuity based upon accumulated member contributions plus credited interest. If the member is over age 55, he or she will receive not less than the superannuation allowance to which he or she is entitled.

Accidental Disability:

Eligibility: Applies to members who become permanently and totally incapacitated for further duty as a result of a personal injury sustained or hazard undergone while in the performance of duties. There are no minimum age or service requirements. The member must file his or her application prior to attaining statutory "maximum age."

Retirement Allowance: 72% of salary plus an annuity based on accumulated member contributions, with interest. This amount is not to exceed 100% of pay. For those who became members in service after January 1, 1988 or who have not been members in service continually since that date, the amount is limited to 75% of pay. There is an additional pension of $501.36 per year (or $312.00 per year in systems in which the local option contained in G.L. c. 32, s.7 (2)(b)(iii) has not been adopted), per child who is under 18 at the time of the member's retirement, with no age limitation if the child is mentally or physically incapacitated from earning. The additional pension may continue up to age 21 for any child who is a full time student at an accredited educational institution. Those who became members in service after January 1, 1988 or who have not been members in service continually since that date.

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ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION X
SUMMARY OF PLAN PROVISIONS (Continued)

ACCIDENTAL DEATH

Eligibility: Applies to members who die as a result of a work-related injury or if the member was retired for accidental disability and the death was the natural and proximate result of the injury or hazard undergone on account of which such member was retired.

Allowance: An immediate payment to a named beneficiary equal to the accumulated deductions at the time of death, plus a pension equal to 72% of current salary and payable to the surviving spouse, dependent children or the dependent parent, plus a supplement of $312 per year, per child, payable to the spouse or legal guardian until all dependent children reach age 18 or 21 if a full time student, unless mentally or physically incapacitated.

The surviving spouse of a member of a police or fire department or any corrections officer who, under specific and limited circumstances detailed in the statute, suffers an accident and is killed or sustains injuries resulting in his death, may receive a pension equal to the maximum salary for the position held by the member upon his death. In addition, an eligible family member may receive a one time payment of $100,000.00 from the State Retirement Board.

DEATH AFTER ACCIDENTAL DISABILITY RETIREMENT

Effective November 7, 1996, Accidental Disability retirees were allowed to select Option C at retirement and provide a benefit for an eligible survivor. For Accidental Disability retirees prior to November 7, 1996, who could not select Option C, if the member's death is from a cause unrelated to the condition for which the member received accidental disability benefits, a surviving spouse will receive an annual allowance of $6,000 until remarriage or death.

DEATH IN ACTIVE SERVICE :

Eligibility: At least 2 years of service

Allowance: An immediate allowance equal to that which would have been payable had the member retired and elected Option C on the day before his or her death. For death occurring prior to the member's superannuation retirement age, the age 55 benefit rate is used. The minimum annual allowance payable to the surviving spouse of a member in service who dies with at least two years of creditable service is $3,000, provided that the member and the spouse were married for at least one year and living together on the member's date of death.

The surviving spouse of such a member in service receives an additional allowance equal to the sum of $1,440 per year for the first child and $1,080 per year for each additional child until all dependent children reach age 18 or 22 if a full time student, unless mentally or physically incapacitated.

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SECTION X
SUMMARY OF PLAN PROVISIONS (Continued)

COST OF LIVING

If a system has accepted Chapter 17 of the Acts of 1997, and the Retirement Board votes to pay a cost of living increase for that year, the percentage is determined based on the increase in the Consumer Price Index used for indexing Social Security benefits, but cannot exceed 3.0%. The first $12,000 of a retiree's total allowance is subject to a cost-of-living adjustment. The total Cost-of-Living adjustment for periods from 1981 through 1996 is paid for by the Commonwealth of Massachusetts.

METHODS OF PAYMENT

A member may elect to receive his or her retirement allowance in one of 3 optional forms of payment.

Option A: Total annual allowance, payable in monthly installments, commencing at retirement and terminating at the member's death.

Option B: A reduced annual allowance, payable in monthly installments, commencing at retirement and terminating at the death of the member, provided, however, that if the total amount of the annuity portion received by the member is less than the amount of his or her accumulated deductions, including interest, the difference or balance of his accumulated deductions will be paid in a lump sum to the retiree's beneficiary or beneficiaries of choice.

Option C: A reduced annual allowance, payable in monthly installments, commencing at retirement. At the death of the retired employee, 2/3 of the allowance is payable to the member's designated beneficiary (who may be the spouse, or former spouse who remains unmarried for a member whose retirement becomes effective on or after February 2, 1992, child, parent, sister, or brother of the employee) for the life of the beneficiary. For members who retired on or after January 12, 1988, if the beneficiary pre-deceases the retiree, the benefit payable increases (or pops up) to the amount which would have been payable under Option A. Option C became available to accidental disability retirees on November 7, 1996.

ALLOCATION OF PENSION COSTS : If a member's total creditable service was partly earned by employment in more than one retirement system, the cost of the "pension portion" is allocated between the different systems pro rata based on the member's service within each retirement system.

SECTION XI
GLOSSARY OF TERMS

ACTUARIAL ACCRUED LIABILITY That portion of the Actuarial Present Value of pension plan benefits which is not provided by future Normal Costs or employee contributions. It is the portion of the Actuarial Present Value attributable to service rendered as of the Valuation Date.

ACTUARIAL ASSUMPTIONS Assumptions, based upon past experience or standard tables, used to predict the occurrence of future events affecting the amount and duration of pension benefits, such as: mortality, withdrawal, disablement and retirement; changes in compensation; rates of investment earnings and asset appreciation or depreciation; and any other relevant items.

ACTUARIAL COST METHOD (or FUNDING METHOD) A procedure for allocating the Actuarial Present Value of all past and future pension plan benefits to the Normal Cost and the Actuarial Accrued Liability.

ACTUARIAL GAIN OR LOSS (or EXPERIENCE GAIN or LOSS) A measure of the difference between actual experience and that expected based upon the set of Actuarial Assumptions, during the period between two Actuarial Valuation dates.

Note: The effect on the Accrued Liability and/or the Normal Cost resulting from changes in the Actuarial Assumptions, the Actuarial Cost Method or pension plan provisions would be described as such, not as an Actuarial Gain (Loss).

ACTUARIAL PRESENT VALUE The dollar value on the valuation date of all benefits expected to be paid to current members based upon the Actuarial Assumptions and the terms of the Plan.

AMORTIZATION PAYMENT That portion of the pension plan appropriation which represents payments made to pay interest on and the reduction of the Unfunded Accrued Liability.

ANNUAL STATEMENT The statement submitted to PERAC each year that describes the asset holdings and Fund balances as of December 31 and the transactions during the calendar year that affected the financial condition of the retirement system.

ANNUITY RESERVE FUND The fund into which total accumulated deductions, including interest, is transferred at the time a member retires, and from which annuity payments are made.

ANNUITY SAVINGS FUND The fund in which employee contributions plus interest credited are held for active members and for former members who have not withdrawn their contributions and are not yet receiving a benefit (inactive members).

ACTUARIAL VALUATION REPORT, 1/1/1999

SECTION XI
GLOSSARY OF TERMS (Continued)

ASSETS The value of securities as described in Section VIII.

COST OF BENEFITS The estimated payment from the pension system for benefits for the fiscal year. This is the minimum amount payable during the first six years of some Funding Schedules.

EXPENSE FUND The fund into which the appropriation for administrative expenses is paid and from which all such expenses are paid.

FUNDING SCHEDULE The schedule based upon the most recently approved actuarial valuation which sets forth the amount which would be appropriated to the pension system in accordance with Section 22D of M.G.L. Chapter 32.

GASB Governmental Accounting Standards Board

NORMAL COST Total Normal Cost is that portion of the Actuarial Present Value of pension plan benefits which is to be paid in a single fiscal year. The Employee Normal Cost is the amount of the expected employee contributions for the fiscal year. The Employer Normal Cost is the difference between the Total Normal Cost and the Employee Normal Cost.

PENSION FUND The fund into which appropriation amounts as determined by PERAC are paid and from which pension benefits are paid.

PENSION RESERVE FUND The fund which shall be credited with all amounts set aside by a system for the purpose of establishing a reserve to meet future pension liabilities. These amounts would include excess interest earnings.

SPECIAL FUND FOR MILITARY SERVICE CREDIT The fund which is credited with amounts paid by the Retirement Board equal to the amount which would have been contributed by a member during a military leave of absence as if the member had remained in active service of the. In the event of retirement or a non-job related death, such amount is transferred to the Annuity Reserve Fund. In the event of termination prior to retirement or death, such amount shall be transferred to the Pension Fund.

UNFUNDED ACCRUED LIABILITY The excess of the Actuarial Accrued Liability over the Assets.

Appendix 1:

ACTUARIAL ASSUMPTIONS & LIABILITIES OVERVIEW

What are the basic actuarial assumptions?

MEMBERSHIP CHARACTERISTICS

- Longevity
- Termination
- Disability
- Retirement

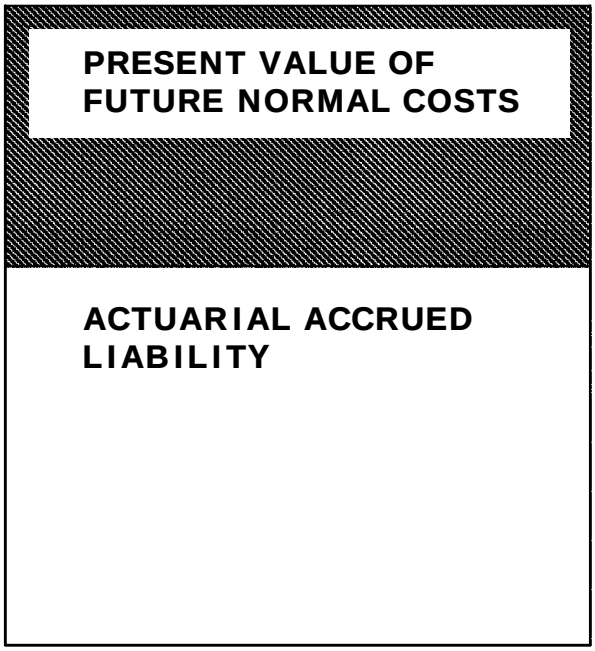
ECONOMIC VARIABLES

- Investment return
- Salary increases
- Inflation
- COLA increases

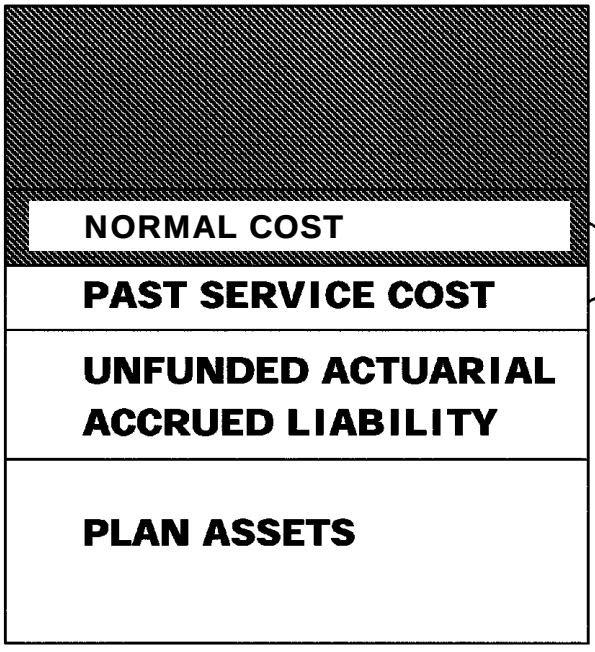
What are actuarial liabilities?

- Present value of future benefits
- Present value of future normal costs
- Normal cost
- Actuarial accrued liability
- Unfunded actuarial accrued liability

Present Value of Future Benefits



Present Value of Future Benefits



Annual Funding Requirement
= Normal (Current) Cost
plus
Past Service Cost

ANNUAL ACTUARIAL FUNDING REQUIREMENT

Unfunded Actuarial Accrued Liability
= Actuarial Accrued Liability
minus
Plan Assets

Calculation for Sample Member

DATA
Group 1

Hire Age	35	
Current Age	55	
Current Service	20 years	
Service at age 65	30 years	
Average pay at 55	$30,000	
Expected pay at 65	$48,800	(5% salary increases assumed)

Calculation for Sample Member (Cont.)

1. Accrued benefit at age 55 (payable at age 65)	.025 x 30,000 x 20 = 15,000
2. Projected benefit at age 65 based on service to date	.025 x 48,800 x 20 = 24,400
3. Projected benefit at age 65 based on service to date at end of year	.025 x 48,800 x 21 = 25, 620
4. Benefit increase during year: (3) - (2)	1,220
5. Projected benefit at age 65	.025 x 48,800 x 30 = 36,600

Present Value Factors

Present value of $1.00 per year for life	INTEREST RATE	
	7.0%	8.0%
AGE 65		
1983 Group Annuity (Unisex)	9.87	9.19
1984 Unisex Pension	8.74	8.20
AGE 55 (PAYABLE AT 65)		
1983 Group Annuity (Unisex)	4.69	**3.98**
1984 Unisex Pension	3.85	3.30

Present Value Calculations for Sample Member

Present value of accrued benefit — 15,000 x 3.98 = 59,700

Present value of projected benefit based on service to date (Accrued Liability) — 24,400 x 3.98 = 97,112

Present value of increase during the year (Normal Cost) — 1,220 x 3.98 = 4,856

Present value of future benefits — 36,600 x 3.98 = 145,668

Determination of Liabilities for Actuarial Valuation

Total Normal Cost for the System is the sum of Normal Cost for each individual participant

Total Actuarial Accrued Liability for the System is the sum of the Actuarial Liability for each individual participant.

Appendix 2:

ILLUSTRATION OF IMPACT OF INVESTMENT RETURN ASSUMPTIONS ON PLAN LIABILITIES

Development of Normal Cost

	8.0%	8.5%	PERCENT DECREASE
Total Normal Cost	$4,000	$3,600	10.0%
Employee Contributions	2,500	2,500	
Employer Normal Cost	1,500	1,100	26.7%

Development of Amortization of Unfunded Actuarial Liability

	8.0%	8.5%	PERCENT DECREASE
Actuarial Accrued Liability	$75,000	$70,000	6.7%
Assets	45,000	45,000	
Unfunded Liability (1)-(2)	30,000	25,000	16.7%
Amortization of Unfunded Liability (30 Years Level)	2,467	2,144	13.1%

Development of Appropriation

	8.0%	8.5%	PERCENT DECREASE
Employer Normal Cost	$1,500	$1,100	26.7%
Amortization of Unfunded	2,467	2,144	13.1%
Total Appropriation	3,967	3,744	18.2%

Appendix 3:

RECORD LAYOUTS FOR ACTIVE & RETIREE DATA FILES (OCTOBER, 1998)

Active Record Layout

Records are fixed-length. Record size is 342.
File organization is consecutive.

Field Name	Start Posn	Int Fmt	Int Len	Ext Len	Dec Pos	Occur Count	Alias Name
BOARD NUM	01	U	03	03	0	1	ACTV-BOARD-NUM
SOCSECNO	04	C	09	09	0	1	ACTV-SS-NUM
LASTNAME	13	C	20	20	0	1	ACTV-NAME-LAST
FRSTNAME	33	C	14	14	0	1	ACTV-NAME-FIRST
MIDDNAME	47	C	14	14	0	1	ACTV-NAME-MIDDLE
SUFFIX	61	C	03	03	0	1	ACTV-NAME-SUFFIX
SEX	64	C	01	01	0	1	ACTV-SEX
BIRTHDAY	65	U	08	08	0	1	ACTV-DOB
DATADATE	73	U	08	08	0	1	ACTV-DATE-OF-DATA
JOBGROUP	81	C	01	01	0	1	ACTV-JOB-GROUP
MRTLSTAT	82	C	01	01	0	1	ACTV-MARITAL-STATUS
SPOUSDOB	83	U	08	08	0	1	ACTV-SPOUSE-DOB
NUMCHILD	91	C	02	02	0	1	ACTV-NUMBER-CHILDREN
DEPTMENT	93	C	04	04	0	1	ACTV-DEPARTMENT
EMPLDATE	97	U	08	08	0	1	ACTV-EMPLOYMENT-DATE
ADJEMPLD	105	U	08	08	0	1	ACTV-ADJ-DATE-OF-EMPLOYMENT
ASFBALAN	113	U	09	10	2	1	ACTV-ASF-BALANCE
ASFCONTR	122	U	09	10	2	1	ACTV-ASF-CONTRIBUTIONS
ASFINTRS	131	U	09	10	2	1	ACTV-ASF-INTEREST
YRSALARY	140	U	08	08	0	1	ACTV-CURRENT-YEAR-SALARY
AMTSALRY	148	U	09	10	2	1	ACTV-CURRENT-SALARY
FULLPART	157	U	03	03	0	1	ACTV-FULL-OR-PART-TIME
MKUPBALN	160	U	09	10	2	1	ACTV-MAKEUP-BALANCE
MKUPCURR	169	U	09	10	2	1	ACTV-MAKEUP-CURR-CONTRIBUTION
MKUPINTR	178	U	09	10	2	1	ACTV-MAKEUP-INTEREST
MKUPANPY	187	U	09	10	2	1	ACTV-MAKEUP-ANNUAL-PAYMENT
PREVBRD1	196	U	03	03	0	1	ACTV-PREV-BOARD1
PRVSTRT1	199	U	08	08	0	1	ACTV-PREV-START1
PREVEND1	207	U	08	08	0	1	ACTV-PREV-END1
PREVBRD2	215	U	03	03	0	1	ACTV-PREV-BOARD2
PRVSTRT2	218	U	08	08	0	1	ACTV-PREV-START2
PREVEND2	226	U	08	08	0	1	ACTV-PREV-END2
PREVBRD3	234	U	03	03	0	1	ACTV-PREV-BOARD3
PREVSTRT3	237	U	08	08	0	1	ACTV-PREV-START3
PREVEND3	245	U	08	08	0	1	ACTV-PREV-END3
CREDSERV	253	U	05	06	3	1	ACTV-CREDITABLE-SERVICE
VETCODE	258	C	01	01	0	1	ACTV-VET-CODE
STATUS	259	U	02	02	0	1	ACTV-STATUS-CODE

Active Record Layout (cont.)

Records are fixed-length. Record size is 342.
File organization is consecutive.

Field Name	Start Posn	Int Fmt	Int Len	Ext Len	Dec Pos	Occur Count	Alias Name
STATDATE	261	U	08	08	0	1	ACTV-STATUS-DATE
MILTSERV	269	U	05	06	3	1	ACTV-MILITARY-SERVICE-YEARS
CONTRATE	274	U	02	03	2	1	ACTV-CONTRIBUTORY-BASE-RATE
INCRRATE	276	U	01	01	0	1	ACTV-INCREMENT-RATE
XTRACONT	277	U	09	10	2	1	ACTV-EXTRA-CONTRIBUTIONS
XTRACURR	286	U	09	10	2	1	ACTV-EXTRA-CURRENT-CONTRIBS
XTRAINTR	295	U	09	10	2	1	ACTV-EXTRA-INTEREST
XTRARATE	304	U	04	05	2	1	ACTV-EXTRA-RATE
REFUNDS	308	U	09	10	2	1	ACTV-REFUNDS
TOTLCRED	317	U	05	06	3	1	ACTV-TOTAL-CREDITABLE-SERVICE
FILLER	322	C	16	16	0	1	
GOVUNIT	338	C	04	04	0	1	Governmental Unit Code
FILLER	342	C	01	01	0	1	

Retiree Record Layout

Records are fixed-length. Record size is 342.
File organization is consecutive.

Field Name	Start Posn	Int Fmt	Int Len	Ext Len	Dec Pos	Occur Count	Alias Name
BOARDNUM	01	C	03	03	0	1	RETR-BOARD-NUM
SOCSECNO	04	C	09	09	0	1	RETR-SS-NUM
LASTNAME	13	C	20	20	0	1	RETR-NAME-LAST
FIRSTNAME	33	C	14	14	0	1	RETR-NAME-FIRST
MIDDNAME	47	C	14	14	0	1	RETR-NAME-MIDDLE
SUFFIX	61	C	03	03	0	1	RETR-NAME-SUFFIX
SEX	64	C	01	01	0	1	RETR-SEX
BIRTHDAY	65	U	08	08	0	1	RETR-DOB
DATADATE	73	U	08	08	0	1	RETR-DATE-OF-DATA
RETRDATE	81	U	08	08	0	1	RETR-RETIRE-DATE
OPTIONC	89	C	01	01	0	1	RETR-OPTION-C-SURV
OPTCPOP	90	U	05	06	4	1	RETR-OPT-C-FACTOR
RETRTYPE	95	U	02	02	0	1	RETR-RETIRE-TYPE
RETROPT	97	C	01	01	0	1	RETR-RETIRE-OPTION
JOBGROUP	98	C	01	01	0	1	RETR-JOB-GROUP
AVSALARY	99	U	09	10	2	1	RETR-FIN-AVG-SALARY
ACCUMDED	108	U	09	10	2	1	RETR-ACCUM-DEDUCTIONS
CREDSERV	117	U	05	06	3	1	RETR-CREDITABLE-SERVICE
DEPTMENT	122	C	04	04	0	1	RETR-DEPARTMENT
BENEFSEX	126	C	01	01	0	1	RETR-BENEF-SEX
BENEFDOB	127	U	08	08	0	1	RETR-BENEF-DOB
BENEFREL	135	C	01	01	0	1	RETR-BENEF-RELAT
NODEPCHI	136	U	02	02	0	1	RETR-DEP-CHILDREN
DOBYOUNG	138	U	08	08	0	1	RETR-DOB-YOUNGEST-DEP
VETCODE	146	C	01	01	0	1	RETR-VET-CODE
PAYSTAT	147	U	01	01	0	1	RETR-PAYMENT-STATUS
DOD	148	U	08	08	0	1	RETR-DATE-OF-DEATH
BENEFDOD	156	U	08	08	0	1	RETR-BENEF-DATE-OF-DEATH
ORIGAMNT	164	U	09	10	2	1	RETR-ORIG-AMOUNT
ANNUITY	173	U	09	10	2	1	RETR-ANNUAL-ANNUITY
ORIGPENS	182	U	09	10	2	1	RETR-ORIG-PENSION
ORIGDEPN	191	U	09	10	2	1	RETR-ORIGINAL-DEPENDENCY
ANRESERV	200	U	09	10	2	1	RETR-ANN-RESERVE
FY82COLA	209	U	09	10	2	1	RETR-PRE-FY82-COLA
FY81COLA	218	U	09	10	2	1	RETR-POST-FY81-COLA
CURRPAYB	227	U	09	10	2	1	RETR-CURR-PAY-AMOUNT
YRSLASTB	236	U	05	06	3	1	RETR-YEARS-LAST-BOARD

Retiree Record Layout (cont.)

Records are fixed-length. Record size is 342.
File organization is consecutive.

Field Name	Start Posn	Int Fmt	Int Len	Ext Len	Dec Pos	Occur Count	Alias Name
PREVBRD1	241	U	03	03	0	1	RETR-PREV-BOARD1
PREVYRS1	244	U	05	06	3	1	RETR-PREV-YEARS1
PREVBRD2	249	U	03	03	0	1	RETR-PREV-BOARD2
PREVYRS2	252	U	05	06	3	1	RETR-PREV-YEARS2
PREVBRD3	257	U	03	03	0	1	RETR-PREV-BOARD3
PREVYRS3	260	U	05	06	3	1	RETR-PREV-YEARS3
WRKCMPWK	265	U	07	08	2	1	RETR-WORKERS-COMP-WEEKLY
WKCMPLMP	272	U	11	12	2	1	RETR-WORKERS-COMP-LUMP
POST97COLA	283	U	09	10	2	1	Post 1997 COLA
FILLER	292	C	46	46	0	1	
GOVUNIT	338	C	04	04	0	1	Governmental Unit Code
FILLER	342	C	01	01	0	1	

Key to Record Layouts

Field Name	Eight character field identifier
Start Position	Starting location within the data record
Internal Format	P-packed, B-binary, C-character, Z-zoned, U-unsigned (packed = Computational)
Internal Length	Maximum values: P-8, B-4, C-132, Z-15,U-15
External Length	only if not calculated from internal length
Alias Name	Alternative 26 character field description.

Appendix 4:

GLOSSARY OF ACTUARIAL TERMS

ACTUARIAL ACCRUED LIABILITY

That portion of the Actuarial Present Value of pension plan benefits which is not provided by future Normal Costs or employee contributions. It is the portion of the Actuarial Present Value attributable to service rendered as of the Valuation Date.

ACTUARIAL ASSUMPTIONS

Assumptions, based upon past experience or standard tables, used to predict the occurrence of future events affecting the amount and duration of pension benefits, such as: mortality, withdrawal, disablement and retirement; changes in compensation; rates of investment earnings and asset appreciation or depreciation; and any other relevant items.

ACTUARIAL COST METHOD (OR FUNDING METHOD)

A procedure for allocating the Actuarial Present Value of all past and future pension plan benefits to the Normal Cost and the Actuarial Accrued Liability.

ACTUARIAL GAIN OR LOSS (OR EXPERIENCE GAIN OR LOSS)

A measure of the difference between actual experience and that expected based upon the set of Actuarial Assumptions, during the period between two Actuarial Valuation dates.

Note: The effect on the Accrued Liability and/or the Normal Cost resulting from changes in the Actuarial Assumptions, the Actuarial Cost Method or pension plan provisions would be described as such, not as an Actuarial Gain (Loss).

ACTUARIAL PRESENT VALUE

The dollar value on the valuation date of all benefits expected to be paid to current members based upon the Actuarial Assumptions and the terms of the Plan.

AMORTIZATION PAYMENT

That portion of the pension plan appropriation which represents payments made to pay interest on and the reduction of the Unfunded Accrued Liability.

ANNUAL STATEMENT

The statement submitted to PERAC each year that describes the asset holdings and Fund balances as of December 3l and the transactions during the calendar year that affected the financial condition of the retirement system.

ANNUITY RESERVE FUND

The fund into which total accumulated deductions, including interest, is transferred at the time a member retires, and from which annuity payments are made.

ANNUITY SAVINGS FUND

The fund in which employee contributions plus interest credited are held for active members and for former members who have not withdrawn their contributions and are not yet receiving a benefit (inactive members).

ASSETS

The total value of securities. Assets grow through employer and employee contributions, as well as investment earnings. They are reduced by benefit payments and other disbursements. For valuation purposes, assets are usually measured at market value.

COST OF BENEFITS

The estimated payment from the pension system for benefits for the fiscal year. This is the minimum amount payable during the first six years of some Funding Schedules.

EXPENSE FUND

The fund into which the appropriation for administrative expenses is paid and from which all such expenses are paid.

FUNDING SCHEDULE

The schedule based upon the most recently approved actuarial valuation which sets forth the amount which would be appropriated to the pension system in accordance with Section 22D of M.G.L. Chapter 32.

GASB

Governmental Accounting Standards Board

NORMAL COST

Total Normal Cost is that portion of the Actuarial Present Value of pension plan benefits which is to be paid in a single fiscal year. The Employee Normal Cost is the amount of the expected employee contributions for the fiscal year. The Employer Normal Cost is the difference between the Total Normal Cost and the Employee Normal Cost.

PENSION BENEFIT OBLIGATION

The portion of the Actuarial Present Value attributable to past service in accordance with the Projected Unit Credit cost method as stipulated by GASB Statement Number 5.

PENSION FUND

The fund into which appropriation amounts as determined by PERAC are paid and from which pension benefits are paid.

PENSION RESERVE FUND

The fund which shall be credited with all amounts set aside by a system for the purpose of establishing a reserve to meet future pension liabilities. These amounts would include excess interest earnings.

SPECIAL FUND FOR MILITARY SERVICE CREDIT

The fund which is credited with amounts paid by the retirement board equal to the amount which would have been contributed by a member during a military leave of absence as if the member had remained in active service of the retirement board. In the event of retirement or a non-job related death, such amount is transferred to the Annuity Reserve Fund. In the event of termination prior to retirement or death, such amount shall be transferred to the Pension Fund.

UNFUNDED ACCRUED LIABILITY

The excess of the Actuarial Accrued Liability over the Assets.